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STATEMENT

OF A

THEORY OF LIFE,

FOUNDED ON

OBSERVATIONS & EXPERIMENTS

BY

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TO THE READER.

The vagueness and uncertainty of prevailing opinions on the subject of life, must indeed be humiliating to every admirer of physical science, but particularly mortifying to the practising physician. Intrusted with the lives of his fellow creatures, he is often after, availing himself of all accessible means of information, in most painful uncertainty, as to the course he should pursue, while every good feeling of his nature is calling on him to render service, and avoid injurious or even fatal mistakes. Sensible of this tremendous responsibility, and convinced that the science of disease cannot be advanced without a corresponding advance in the science of life, I have for some years been exerting, to the utmost of my humble powers, to add something to the common stock of knowledge regarding the principle and laws of life. Pursuing the practice of medicine for a livelihood, my observations have been principally directed to the subject as presented by the human body in health and disease—but have also embraced as far as possible, the grand field of life in extenso. The result has been so much to my own satisfaction, and the views of disease, in my opinion, so far simplified, that I feel no apology necessary in submitting my inquiries to the faculty. An enlarged discussion of the subject, accompanied with details of such experiments and observations as I have made, will probably appear before long. The present is a mere sketch of opinions I have been led to adopt, and is principally designed for the consideration of a few scientific friends and others to whom it is sent, with a hope that the doctrines may be more rapidly matured

by aid from their communications, which are hereby respectfully solicited. The statement I am aware will suffer at present by being unaccompanied with detailed proof, yet I feel confident that to the philosophical reader, much proof will suggest itself as he proceeds, & much more may be had, by the performance of a few simple experiments, which will naturally suggest themselves. The congruity, too, and mutual support of the parts of this theory, together with its simplicity, constitute an amount of proof in its favor, which, we hope, will arrest attention notwithstanding its imperfections, & the obscurity of its author.

The application of the principles advanced, is extensive as Nature herself; but it is intended here, to state only, as briefly but comprehensively as possible, the leading doctrines as they relate to the science of Medicine. In order to this, however, my views of matter in general, must first be stated. Secondly, will be noticed, life and living matter; thirdly, the parts of the human body, principally concerned in the development of life; fourthly, the functions of the human body; fifthly, the functions of the mind; sixthly, diseases of the body; seventhly, diseases of the mind; & lastly, remedies. The easy & satisfactory explanations of the latter subjects, & particularly of diseases & their remedies which are furnished by the principles here advanced, have been a source of much delight to myself. How they will meet the views of the faculty in general, time must reveal. Such as, after a candid examination, believe that a new field of investigation is opened, are cordially invited to assist in exploring it, by THE AUTHOR.

BROWNSVILLE, FAYETTE COUNTY, PA.
August, 1829.

§ I. OF MATTER IN GENERAL.

1. *Primary Principles.*—Matter is naturally divided into two primary principles, which shall be named simply *solid* and *fluid*. *Solid* is composed of indivisible parts or particles, of different forms, which produce the differences of elementary bodies. *Fluid* does not cohere to form ultimate particles, but is essentially repulsive of itself and infinitely attenuated. Natural bodies consist of solid & fluid, in varying proportions; yet their solidity and fluidity are not owing merely to the proportions of solid and fluid they contain, but are mixed effects of these proportions and the structures of their component particles. The terms solid and fluid, must here be understood to denote these primary principles and not natural bodies, unless the latter are named.

2. *Primary Laws.*—Solid particles tend to occupy the least possible space, or in other words, to perfect solidity. Fluid, on the other hand, tends to occupy the greatest possible space, or in other words, to equal and universal diffusion.

3. *Diffusion of the Primary Principles.*—As fluid tends to equal diffusion throughout space, solid particles with regard to it are vacua, which it enters and fills in varying proportions, according to their varying capacities and susceptibilities, arising from their differences of form. The particles thus enlarged, with the exception which will be mentioned hereafter, are kept in contact, so as to avoid interstices or vacua of solid. Artificial vacua are only void of solid, for they contain their full quantity of fluid, which cannot be excluded in the least from even the torricellian vacuum.

4. *Composition of Bodies.*—Bodies are composed of solid particles, charged with fluid in different proportions. The amount of fluid a solid particle can receive, is the measure of its capacity; and this is different, not only in different elementary particles, but in the same, under different degrees of pressure. As all particles exclude fluid as much as possible, many contain less than their capacity would admit of.

The facility with which fluid enters bodies is inversely as their excluding power, and may be called their *susceptibility*. The relative quantities which bodies contain in equilibrio, are their *specific* quantities. Any addition to, or subtraction from, specific quantity, constitutes the plus or minus state respectively.

5. *Attraction or Gravity.*—All particles of bodies are vacua in relation to fluid, as they exclude it; consequently fluid will press on them for admittance in the same proportion. This produces specific gravity, which is in all cases inversely as fluid and directly as fluidal pressure. Thus, suppose a single body of matter as the earth, containing a lesser proportion of fluid, placed in a boundless atmosphere containing a greater, it is evident that fluid tending to enter the former will press it equally on all points of its surface, in columns from infinite space, like rays to a centre, & thus keep it fixed in its place. Now, suppose two bodies, as the sun & earth, placed at any distance from

each other, in the same medium: As each will cut off from the other, that portion of superincumbent fluid which is exteriour to it, the interiour or facing parts of the bodies being partly relieved from fluidal pressure, the bodies will tend to approach each other. This is attraction of gravitation, by which the earth tends to the sun and smaller bodies to the earth. The same takes place also between smaller bodies themselves, but the paramount tendency to the earth renders it scarcely perceptible, unless all other particles containing more fluid, are removed from between them and they are brought into absolute contact. They are then kept together by the same cause, which in this instance is called *attraction of aggregation*.

6. *Division of Fluid.* Fluid, as it relates to the particles, may be divided into essential, disposable, and transient.

The first is that portion which the particle, by reason of its structure, has not the power under its proper pressure, to expel. It varies in different elementary particles, but is constant and definite in each, and being necessary to its character, may be named *essential fluid*. The substance containing the largest quantity of essential fluid, is hydrogen gas.

When the essential fluid does not make up the specific quantity of the particle, any addition it contains is *disposable fluid*, which the particle may receive or expel, instantly, under its proper pressure. This still falls short of filling the capacity of the particle in proportion to the excluding power of the latter. The substance containing the largest proportion of disposable fluid is oxygen gas, which contains exceedingly little if any essential fluid.

Transient fluid is projectile fluid, or that which by projectile force passes through particles, the capacities of which are filled, and which yield a passage in virtue of their elasticity, or that quality by which they would receive more fluid and occupy more space if external pressure were removed. The slight increase of size which the particle undergoes, during the passage of transient fluid, may be called *distension*, to distinguish it from mere repletion, which is the limit of specific quantity under ordinary pressure.

Essential and disposable fluids are known by the names of *calorick*, *electricity*, &c. Transient fluid is called *light*.

7. *Tendency of Fluid to Equilibrium in Bodies.* When a body is in the plus state, fluid is forced away and solid approaches, by which other particles recede in proportion as their quantity of essential fluid is greater, and approach as it is smaller. Hence minus particles tend most to approach those which are plus, and when nothing prevents they rush into contact and receive the redundant fluid, as is exemplified in many electrical and Voltaic phenomina.

Of particles containing their specific quantities, those which contain least essential fluid, tend most strongly to plus particles, which they do, by dismissing their disposable fluid, as they approach. Hence plus bodies, in open air, assume an oxygenous atmosphere, as is seen in [illegible] and electrical phenomina. Where neither minus nor

particles containing less essential fluid are within reach, the redundant fluid of the plus particles, having no other outlet, is forced on those in contact, and by these on the next, till an equilibrium is produced. This is *heating* and *cooling* and proceeds more or less rapidly according to the capacity and receptiveness of the successive particles, which, together, determine their characters as *conductors* of heat or calorick.

Bodies in the minus state, are exactly opposite to those in the plus, as regards the above explanations. They attract plus particles, assume a nitrogenous atmosphere, or acquire equilibrium by receiving fluid from the adjoining particles.

8. *Chemical Union of Particles.* Simple particles are disposed to unite into compounds, as they are opposite in their proportions of essential fluid, and these componds may again unite with other simple or compound particles for the same reason. Thus where two particles containing different quantities of essential fluid are in contact, that which contains least, in that effort to part with its disposable fluid, which is constant with all particles at all times, is contracted & crowded into the capacity of the other, occupied by its disposable & transient fluids, which latter are crowded out, and the disposable fluid thus thrown off is the heat evolved in composition.

In forming compound particles, it is necessry—1st. That the entering particle have so little essential fluid, that it may contract sufficiently to enter the capacity of the receiving particle.—Oxygen & acids, which are chiefly composed of it, are best suited to this purpose. It is necessary, also, that the receiving particle have enough essential fluid to invite the union. All combustibles are of this kind; but platina, gold, silver, &c. for want of it, do not unite with oxygen.

It is, in the last place, necessary that the receiving particle have sufficient disposable and transient fluids, to leave room in their escape, for the entering particle. For want of this, oxygen cannot unite with many substances which possess the most essential fluid, until their disposable or transient fluid is increased, or, in other words, till their temperature is raised. They will then receive oxygen till their capacity is filled, when they are vitrified. Some bodies, as potasium, sodium, phosphorus, &c. contain disposable fluid enough, at the common temperature, for combination with oxygen. The capacity of the compound, is always less than those of its constituents.

9. *Temperature of Compounds.*—As simple particles in uniting part with their fluid, so compound particles in receiving fluid are separated into their constituents. This separation like the union is gradual, and proceeds as the fluid increases from that quantity which is proper to the compound particles, to that which constitutes the sum of their separate amounts. Fluctuation between their extremes produces temperature. Thus hydrogen and nitrogen gasses, being chiefly filled with essential fluid, cannot separately vary their temperature or stock of fluid to any great extent, or their volume under the same pressure. But combined with oxygen as in [illegible] the atmosphere

water, they produce these affects by fluctuating between complete union and complete separation.

10. *Light.*—When during composition fluid is expelled more rapidly than it can be received by the contiguous particles, it is thrown off and passes through all replete bodies as air, glass, &c, till it meets with those, the capacities of which are not filled. In the projectile state it is light, & the process by which it is produced is combustion. When projectile fluid enters particles which are not replete they expand more or less, by which it is arrested and received or reflected according to their varying susceptibilities. Bodies which receive least and reflect most are white. Those which receive a degree more and reflect as much less are red, and thus on, as reception is increased and reflection diminished, bodies are orange, yellow, green, blue, indigo, violet, or black. In short, colors are owing to the relative *quantities* of light reflected.

11. *Electricity and Magnetism.*—Fluid moving from side to side of particles or masses, rendering the one plus, or positive, the other minus or negative, and again returning to restore the balance, produces the phenomina ascribed to Electricity, Galvanism &c. The plus & minus parts assume their opposite atmospheres, the reciprocal attractions of which prevent an immediate return of fluid when the cause of displacement is removed. Bodies in this state are said to be excited or charged, and attract or repel each other, as their opposite or similar parts are presented. Some substances, & especially ferruginous matters, are capable of adapting their particles so as to remain permanently in this state, and are then called *magnets.* Their opposite extremities or poles will then permanently attract or repel others as above. The Earth itself, beeing, permanently plus to the North and minus to the south, is a great magnet, which regulates all minor ones.

12. *Galvanism.*—The capacity for essential fluid which a particle possesses, admitting neither increase nor decrease of amount under a given pressure, can only increase in one part by decreasing in the opposite at the same time. Bodies may thus become charged by a plus and minus state of their particles, but cannot give passage to fluid, and are consequently *electrics* or *nonconductors.*

The capacity for disposable fluid, by admiting its passage through the particles, constitutes non-electric or conducting power; of course, the more of this capacity a body possesses, the better conductor it is. When a conducting body is charged, there is not a charge of its particles, but an accumulation of disposable fluid in one side, and a proportionate deficiency in the other, *of the body.* If all fluidal pressure were removed from part of the surface of a body, then it is plain, the disposable fluid of that body would be thrown from that part, with a power, as its quantity multiplied by the fluidal pressure of that body; consequently if two bodies are placed in contact, the disposable fluid of the one will enter the other with a power, which is the difference of [illegible] repelling powers. In entering the latter body, the

fluid will either charge its particles or pass thro' them to charge the body, as they are electrics, or conductors, or in other words, as their capacity for essential or disposable fluid is predommant. Suppose a conducting body, as a plate of silver with a fluidal pressure of 10 and disposable fluid of 3, giving an expelling power of 50, suspended in the air, its 5, surrounded on all sides by 10, will remain guarded as it were in its centre. But suppose a plate of zink, with a pressure of 7 and a disposable fluid of 6, giving it an expelling power of 42, brought into contact with it. The two then form one mass, guarded on its opposite sides, by powers of 50 and 42 respectively. This will force fluid from the exteriour surface of the silver to that of the zink with a power of 8, and will at once create a minus or nitrogenous atmosphere of 8 for the silver, and a plus or oxygenous one of the same degree for the zink. If we now separate them, they will remain positive and negative for a short time by means of their opposite atmospheres. Leave them together & connect their opposite sides by another conductor, and we will have a continual circulation of fluid from the silver to the zink, and back again thro' the conductor to the silver. If this communication between the opposite surfaces is not formed, the external zink surface, by uniting with oxygen, will be enabled to throw off fluid, while the opposite of silver will receive an equal quantity from the nitrogen on its surface, and thus a slow passage of fluid will be maintained. If we place two other similar plates in such position, that the silver surface of the latter may receive the fluid dismissed during oxygenation by the zink, of the former, and then connect their opposite surfaces, the effect will be doubled. In this way, by increasing the plates and intervening oxygen, the effect may be increased indefinitely, as is exemplified in Voltaic piles.

Suppose again the human hand applied to glass tube, the former being a conductor with a greater expelling power, the latter decidedly electrical with a lesser expelling power: Now fluid will pass from the hand to the glass, and entering the capacity of the first range of vitreous particles, fluid is thrown from their opposite sides on the next, and so on, the opposite side of the farthest range will be minus, having a nitrogenous atmosphere. This effect, however, will be slight, as the oxygenous atmosphere cannot find access till the hand is removed; but by reapplying the hand in quick succession, as by friction fluid is gradually accumulated and secured by successive additions of oxygenous atmosphere, till the particles are fully plus and minus, or the tube excited. The charging of the Leyden vial is explained in the same way.

§ II. OF LIFE AND LIVING MATTER.

13. *Organized particles.*—A certain number of different elementary particles so arranged as to contain between them an interstice

for receiving a portion of their complement of fluid is an organized particle or globule, and the interstitial fluids of such globules produce the various phenomina of life and vital heat. As the organized particle parts with interstitial fluid, its components assume their respective attractions, producing successively fermentation and putrefaction.

14. *Their primary law.*—The globules like the ultimate particles tend to occupy the least possible space, and consequently to expel their fluid. The interstitial fluid is received and given out however, more slowly than that of the ultimate particles, and hence the globule cannot receive any addition to its interstitial fluid, except from that of other globules; because the fluid of other ultimate particles, instead of waiting a reception by its interstice, is more promptly received by its components; and hence too, fluid passes from globules to ultimate particles more slowly, altho' the latter may be negative.

15. *Their Variations.* The particles of lymph are disposed to assume different distances from each other as their quantity of interstitial fluid is varied, from which it follows, that in contracting they become positive and part with it. Thus, when blood is drawn we may observe fibrin as it parts with its fluid disengaging itself from the serum, and gradually contracting its dimensions. The same would take place in the contraction of muscular fibres, could they in the same manner disengage themselves from the vessels, fluids, nerves, cellular substance, &c. which constitute so large a part of the volume of muscles, and which, not admitting of compression, increases their thickness in contraction nearly as much as they diminish in length. External pressure increases the power of the globules to expel their fluid, while extension renders them negative, and disposes them to receive more.

16. *Division of interstitial fluid.* Interstitial fluid, like that of the ultimate particles, may be divided into essential, disposable, and transient, which produce respectively similar phenomina. The essential fluid, according to its proportion, produces non-conducting or electrical power, and the globules do not part with it but as they are disorganized. This is seen in albumen, fat, cellular substance, &c. The disposable fluid produces conducting or nonelectric power, as appears in medullary matter and coagulating lymph, whether fluid or in the state of muscular matter. The globules of lymph are not however as those of medullary matter merely changed in magnitude by disposable fluid, but so altered in shape as by the mutual distances they thence assume to produce the phenomina of contraction and elongation or muscular motion, and hence muscular fibre in its most contracted state, contains least disposable fluid; in its elongated state, a degree more, and a still greater charge, melts it into fluid fibrin.

17. *Depositories of animal life.* Fibrin and albumen contain that portion of interstitial fluid which is *life*. Albumen, by compression in the liver, is disorganized and made to yield its fluid to supply the constant expenditure of the functions.

18. *Depositories of animal heat.* The red particles in red-blood-

ed animals, are the source of that portion of fluid which is *animal heat*. They are formed of fat, oil, or adipose matter, and prepared for their purpose by an admixture of iron. The iron is derived from water and combined in the liver with the fat to form them. Water we shall see with its solvends, is absorbed exclusively by the veins, and hence the portal veins which absorb all the water drank, must pass through the liver.

19. *Sources of life and heat.* The formation of organized particles is necessarily slow, and hence animals, the functions of which produce a large expenditure of life and heat, require them ready formed. Vegetables which do little more than grow, have time to perform all necessary organization from the primitive elements, and some very inactive animals are said to do the same. But the higher and more active animals all require, ready formed fibrinous or albuminous matter, for the purposes of life, and oleaginous matter for the purpose of heat.

20. *Production of life and heat in the human body.* The vital and oily substances combined in infinite variety with other matters constitute our food or aliments, and their separation and preparation is the work of *digestion.* The fat when prepared is deposited in varying quantities in different interstices of the body, whence, as from storehouses, it may be brought out for use as required. But the vital part, having no such places of deposit, is needed in more constant supplies.

III. OF THE PARTS OF THE HUMAN BODY IMMEDIATELY CONCERNED IN THE DEVELOPEMENT OF LIFE AND HEAT.

21. *Nervous system.* The nervous system, consisting of brain, ganglia, and nerves, is a grand conductor, thro' which fluid passes, in producing the phenomina of life and heat. It is composed of nervous or medullary matter, which is a conductor, enveloped in cellular membrane, which is an electrick, and which forms not only a general envelope for each nerve and ganglion, but particular ones for their minutest parts. A tube of cellular membrane filled with medullary matter constitutes the ultimate fibril of nerve. The membrane surrounding the fibril, we will call *neurilema*, that surrounding the whole nerve *envelope.* The brain and ganglia act as valves placed in the course of the nerves, and may be divided into four orders: 1st. The brain itself is a common ganglion, and the only one of the first order, so constructed as to admit a mutual influence between the passing fluid and the mind or soul. The 2nd order, consists of those belonging to the posteriour fasciculi of the spinal nerves, the ganglion of Gasser, the olfactory, and ophthalmick ganglia, and the maxillary ganglion when it exists. To the 3d order belongs, that chain which commences with the spheno-palatine, and descends along the spine,

connected by what is called the continuation of the sympathetick nerve. The 4th order, consists of the cardiac or ganglion of Wrisberg when it exists, the coeliac, constituting together the great semilunar ganglion, the small ganglia frequently found in the renal plexus, and that sometimes found in the hypogastrick plexus.

The nerves are to be divided into *receiving*, *discharging*, and *equalizing*. The receiving nerves embrace all the nerves of the body, except the discharging and equalizing. The discharging nerves are the par vagum, and spinal accessory of the eighth pair. The equalizing nerves are those which connect ganglia of the same order, and belong principally to the third order.

The receiving nerves of a ganglion, may be divided into *ganglionick* and *functional*, as they go to other ganglia or directly to organs, the functions of which depend on them. Thus the posteriour fasciculi of the spinal nerves are ganglionick, the anteriour, functional. The different orders of ganglia have both ganglionick and functional nerves, except the fourth or last, which can have only the latter.—Somtimes a ganglionick nerve passes the next order and is united to one more distant. Thus, a branch of the sixth pair, passing the second order and uniting to the superiour cervical ganglion, forms a direct communication between the brain and chain of the third order, and the vidian branch of the portio dura in uniting to the spheno-palatine ganglion, does the same. The functional nerves, we will divide into *muscular and absorbent*, as they subserve the purposes of muscular motion or absorption.

22. *Parts in which the nerves terminate.* These are muscular fibres and cells, and the internal surfaces of the heart and lymphatick glands, the former producing motion may be called *moving* nerves the latter producing attraction or absorption may be called *absorbing* nerves. Muscular fibres we will divide inot *vascular* and *organick*, the former belonging to the arteries veins and lymphaticks of the circulating system, the latter to the separate and circumscribed organs. Among the absorbing nerves, we rank the gustatory nerves which terminating on the upper surface of the tongue, like those in lymphatick glands, attract the particles of food by which *taste* is produced.

23. *Parts which terminate in the neurilema.* These are blood-vessels, lymphaticks and excretories. Part of the arteries terminate directly in veins, and are the proper circulating vessels, while part of the arteries with corresponding veins, open into the neurilema throughout the nervous system. The former possessing muscular fibres to aid the circulation, will be called *muscular* vessels, the latter composed intirely of cellular membrane will be named *cellular* vessels. The lymphaticks may also for similar reasons be divided into *muscular* and *cellular*, the former being the great branches or vasa efferentia between the glands and great veins, the latter being the vasa inferentih on those between the nerves and lymphatick glands.

In secreting glands, the excretory ducts also ultimately open into the neurilem, and on all surfaces, *pores* abound in the same membrane, for the passage of secretions.

§ IV. OF THE FUNCTIONS OF THE HUMAN BODY.

21. *Functions of the nerves.* Fluid is continually passing thro' the nervous system, entering the receivers and leaving the dischargers, and thus producing the functions of the body. While every ganglion gives passage to its proper proportion of the whole fluid, any increase in the quantity furnished by one or more of its receivers, must be accompanied with a corresponding diminution in that of the remainder. In this way, not only are muscular contraction and absorption alternately increased and diminished, but the contractions of the vascular and organick fibres of the same parts exhibit those reciprocal affects. To suspend vascular, during organick contraction, *diverticula* are provided to receive blood for a time and keep it from distending the vessels. Thus the spleen and pancreas are diverticula for the digestive organs, the glandulae renales for the kidneys and diaphragm, the prostate gland, for the urinary bladder. The thyroid gland, is a diverticulum for the larynx and the skin by the fulness and redness it acquires, is evidently so for the voluntary muscles. Where long continued contraction is necessary, the muscles are still further protected from a forcible ingress of blood, by the principal artery which furnishes the part, being divided into numerous branches and again united, to check the impetus of the heart. Of this, examples may be seen in the arm of the sloth, and jaws of the lion and other carnivous animals.

Where *equalizing* nerves connect different ganglia they give passage to fluid in common, and hence when a call for fluid is made on a receiving nerve if it does not obtain its supply from the fibre or gland, a check is made for the deficiency on the other nerves of the same ganglion. If this is still insufficient to meet the demand, and there are equalizing nerves, then the receivers of all the connected ganglia are laid under contribution. If this still fails, a check is made on the receivers of the next interior order of ganglia, in the same manner, the fluid accumulating here as at a valve or valves; and so on till the requisite portion is furnished, to produce an equepoise in the nervous system. Thus, suppose a call for fluid is made on a receiving nerve of the great semilunar ganglion. If it is not furnished by the fibre or gland in which the nerve terminates, all the remaining receivers of the ganglion are laid under contribution. Next the fluid of the splanchnick nerves accumulating at this ganglion, their interior extremities become minus or negative, and thus a draw is made on the receivers of the ganglia of the third order, or as many of it as are connected by equalizers. If this still fails the second order is tried in the same way, and lastly the brain, if all the rest fail to make up the amount re-

quired to produce a balance. Fluid is brought into the receivers from the muscular tissue & lymphatick glands, by

25. *Stimulation.* Any thing which causes the disorganization of a red particle, in a receiving nerve, so as to set loose its interstitial fluid, is a stimulus, and the fluid thus liberated, is *vital heat*. The exercise of this power is stimulation which depends for continuance on the distruction of successive red particles, and the renewed supply of successive portions of fluid in the nervous system, to counterpoise it. Thus suppose any part of a receiving nerve pressed till a red particle is disorganized, and its fluid driven off; the carbonaceous residue of this particle will be negative and attract fluid thro' the medullary substance in quantity sufficient to form an equipoise.

Stimuli may be divided into *mechanical*, *chemical*, and *mental*. Mechanical stimulants produce their effects by pressing or extending the nerve, so as to destroy the red particles it contains. Chemical stimulants so alter the relative positions of the nervous particles that the red particles are necessarily destroyed in passing them. Stimulation in the latter case continues for a longer or shorter time, after the stimulant is removed, & even after the destruction of the red particles ceases, it is often a considerable time before the nervous particles so far assume their former position as to yield to a renewal of the same impression. This restoration in some cases does not take place for years or even during life, as is the case after stimulus of infection from smallpox, scarlet fever, measles &c. Mental stimulus is the stimulus of the mind on the brain in the production of thought. It is physiologically similar, and perfectly reciprocal with other stimuli.—The effect of stimulus on one of the receivers of a ganglion in furnishing fluid may be increased without any decrease in that of the others, until the full quantity which the ganglion will transmit is brought forward. After that, any increase of effect in one, produces a corresponding decrease in that of the remainder; the stronger stimulus still suspending the action of the weaker in due ratio, as it furnishes fluid. On this fact is founded the principle of *counteraction* or *counterirritation*, so important in the practice of physick.

The power of stimuli increases as the fulness of the cellular vessels of the part, and their fulness in turn is increased as calorick is liberated to expand them.

26. *Respiration.* Muscular matter in elongating becomes negative and attracts fluid, by which means the latter is brought thro' the discharging nerves from the whole receiving system. The trapezius and constrictor muscles of the pharynx, by means of the spinal accessory nerve, are thus supplied with the means of elongation without checking on the general stock. This nerve mostly arising from the posterior fasciculi of those nerves which supply the superior extremity, produces a reciprocal connection between the muscles of the arms and those of deglutition in eating.

But the muscular matter constituting the ultimate muscular cells

in the lungs, by means of the par vagum, is the principal instrument for attracting fluid from the whole receiving system. During inspiration blood rushes into these cells, from the pulmonary arteries, which terminate in them, while air fills their cellular envelopes in which the ramifications, of the bronchia terminate. The entrance of blood renders the muscular cells negative, by which means, fluid is attracted to supply them. During expiration the carbonised air is driven out and the fluid which is again forced from the muscular cells, & prevented from regurgitating by the valvular structure of the brain at once renders all branches of the nerve positive, and furnishes to the lymph of the blood as it passes the lungs the fluid necessary to meet its great expenditure in digestion and absorption. These effects arise from each inspiration and expiration, by which the lungs are at once an outlet for carbon and a grand pump for drawing in and discharging the fluid of the body. In the fetus this latter office is performed by the thymus gland.

The positive state of the dischargers during expiration produces the following important effects. Those terminating on the inner surface of the heart, besides absorbing as we shall see, the carbonaceous residue of stimulation from the whole system, communicate to it a portion of fluid preparatory to its oxygenation and elimination from the lungs. Those terminating in the organick fibres of the stomack furnish the means of free dilatation for the reception of food and drink, and prevent their immediate expulsion by vomiting when the receivers are excited. Those terminating in the ultimate muscular cells of the liver dilate them for the reception of *portal* blood, which could not otherwise gain admission, without aid from the heart. When these cells are filled their receivers are excited, so that as during the succeeding inspiration the liver is compressed by the diaphragm and abdominal muscles, they are again contracted and propel their contents. The blood of the hepatick artery thrown into the envelopes of the muscular cells, during expiration, being compressed, during inspiration, its lymph and albumen yield their fluid to the excited receivers of the muscular cells, and thus in a negative state being no longer absorbable by the lymphaticks, they pass off by the hepatick ducts in the shape of bile. While on the functions of the liver, which can scarcely be separated from those of the lungs, we may observe, that this sacrifice of blood conveyed by the hepatick artery yields a continual supply of fluid to meet the expenditure of the functions of life, and creates a constant demand for fibrinous or albuminous food. After parting with interstitial fluid the biliary residue gives way to that attraction of its ultimate particles which constitutes putrefaction, the commencement of which process in a negative state of its subject, is marked by a bitter taste, as is most evident in cystic bile.

27 *Muscular motion.* When receiving nerves which terminate in muscular fibres are stimulated, fluid escapes from the fibres and rushes to the negative residue of the red particles, producing *contraction*.

When distending force is applied, the fibres becoming negative again attract fluid from whatever lymph is in contact with the medullary matter of their nervous fibrils, and are thus elongated. These affects are *muscular motion*. When contraction is produced by the operation of the will on the functional nerves of the brain it is *voluntary* motion. If a receiving nerve terminates in muscular fibre by the intervention of cellular substances and a discharging nerve terminates directly in the same, then as the former is stimulated, fluid rushes from the latter, but is arrested in the fibre, which is consequently elongated. Thus the glosso-pharyngeal nerve by means of a spring of par vagum, which accompanies it, has the power of elongating the *linguales* and other muscles of the tongue. It also sends a branch with others from the par vagum and spinal accessory, to the *constrictors* of the pharynx for the same purpose.

23. *Absorption* As regards the substance taken up, absorption is *positive* or *negative*. The receiving nerves creeping along the muscular absorbents, terminate on the inner surface of the glands and absorb through the cellular lymphaticks, all positive substances which may be thrown into the neurilema by the cellular arteries. The fibrin, albumen and red particles which escape distruction are thus attracted to the lymphatick glands, whence they are driven into the great veins by the muscular lymphaticks. Chyle is attracted to the *mesenterick glands* and driven forward precisely in the same way. Fibrin in all cases loses a part of its fluid as it passes lymphatick glands. On the other hand the discharging nerves which terminate on the inner surface of the heart, being rendered positive during expiration, attract all negative and oxygenous substances within reach. The residue of the red particles, is thus attracted thro' the cellular veins, to the heart; for although fluid rushes to it from the muscular fibre and lymphatick glands, it can enter but very slowly, because the interstices being obliterated or in other words the globules disorganized, there is no room left but in the ultimate particles. Before the entry then is made, the negative matter is snatched away as it were, by the dischargers of the heart during expiration. Water with all other negative or oxygenous substances are also attracted in the same way. If such substances are even extended to the neurilema, they are brought in through the pores, by this same power, and thence by the cellular veins as before. In this way water &c. are taken up from the bowels, and passing thro' the portal veins, must traverse the liver.

23. *Circulation of blood.* The heart and muscular blood vessels are reciprocal stimulants, and in good health, the power of the former, is exactly equal to the aggregate power of the latter. When the heart contracts, the muscular vessels are dilated until their nerves are stimulated and they in turn contract and fill the heart. When the heart is dilated to a certain point its nerves are again stimulated, it contracts and again fills the vessels and thus the circulation is maintained.

24. *Digestion.* When food is taken in, the stomach is excited &

contracts constantly so as to keep in close contact with its contents. To facilitate this, its diverticulum the spleen, is enlarged and gives passage to more blood which, with a greater quantity also forced into the hepatick artery, increases the functions of the liver and produces more bile to meet the food in the duodenum. As the food comes in contact, through millions of pores, with the blood of the cellular arteries, its globules are gradually charged from the lymph until they are softened into chyme, and finally melted into fluid matter, sufficiently positive for forming chyle and undergoing absorption. This may also take place with organized particles placed under the same circumstances in any part of the body as is well known of animal ligatures, &c. A portion of food remaining in the stomach and becoming highly charged, forms the *gastric fluid*.

As soon as the chyme leaves the stomach, it receives the bile which by its alkaline properties, prevents ascescency and by its bitter quality forms the most appropriate chemical stimulus for the bowels. In those animals the food of which contains but little of the bitter principle the the bitter quality of the bile is more effectually secured by a gall bladder.

As a great supply of fluid from contractions and absorption during digestion must gradually cease as the process is completed, some provision is necessary to guard against the consequences of a reduced supply to the great semilunar ganglion. This provision is found in the *pancreas*. Having no blood-vessel particularly appropriated to it, like other glands, it receives branches from those of the contiguous organs, by which means as those organs become empty or contracted its arteries receive a larger supply of blood. This keeps up the supply of fluid by an increased exercise of its vascular fibres, as well as by the absorption of lymph which is thrown off in secretion, by its cellular arteries.

31. *Secretion, nutrition, and growth.* Of the blood which is poured into the nerves from the cellular arteries, whatever is not taken up by venous and lymphatick absorption, either passes off by the pores or excretories, as *secretion*, or is deposited for *nutrition* or *growth*. The quantity secreted is directly as the quantity of blood thrown in, and inversely as absorption from the part, while its quality depends partly on that of blood thrown in and partly on the relative power of venous & lymphatick absorption in the part. In addition to these the nature of what is deposited in nutrition and growth is influenced by the peculiar attractions of each part, which exist from the primordium of being.

§ V. OF THE FUNCTIONS OF THE MIND.

32. *Sensation by the Receivers.* Increase in the quantity of fluid furnished by any part to the brain, produces in the soul or mind, which is here seated, the simple sensation of *heat*; decrease in the

quantity, produces the opposite sensation of *cold*. Thirst is a modification of this sense of heat in the stomach. Other sensations, from the slightest feeling to the most severe pain, are caused by stimulants producing a tendency to reflux in the brain, and are consequently controuled by the circumstances already mentioned. (24)

As the quantity of fluid necessary to counterbalance, is more likely to be made up without a reflux in the brain, the further it is removed from that organ, it is plain that sensation must become more obscure and uncertain, in the same proportion. The bowels which are furnished from the semilunar ganglion can, on this account, scarcely be said to have *common feeling* at all.

Sensation according to this explanation is diminished as fluid is received into the nerve. Muscular contraction of course tends to destroy it, and so does lymphatick absorption. The latter also, for similar reasons, retards muscular motion, producing in the voluntary muscles, the sensation of fatigue. But its effect in arresting sensation, is not immediate, because sensation is still continued while the lymph is passing through the cellular absorbent, and is only checked as it arrives at the lymphatick gland and its fibrin imparts fluid to the absorbent receivers. The fluid of which the lymph is despoiled, then goes to supply the demands of the stimulus and supercedes that reflux in the brain on which sensation depends. From this cause it arises that sensation has a tendency to intermission, *while the stimulus is continued*, as is more particularly observable in painful affections, such as *cholick*, *gripes*, *tooth-ache*, &c. The nerves subservient to *seeing*, *smelling*, and *hearing*, having no immediate connection with absorbent nerves, are of course not liable to be arrested in their functions, by absorption.

33. *Sensation by the Dischargers.* The action of the receivers of the stomach being in over-proportion to the fluid furnished by its dischargers, produces the sensation of *nausea*, and if this condition is increased to a certain extent, *violent contraction* or *vomiting*, ensues. On the contrary when for want of food in the stomach on which the fibrin of the blood may deposite fluid, it refuses to receive more, as it passes the muscular cells of the lungs in expiration, then the discharging system becomes surcharged, producing the sensation of *hunger*. When these cells do not dilate to attract fluid, the feeling of *suffocation* is produced.

34. *Thought.* The soul produces thought or reflection by its power of stimulation in the brain, so as to create a demand for more fluid than can be supplied. Besides the functional nerves of the brain, which produce contraction and furnish fluid in obedience to the will, there is one immediately connected with those parts of the brain concerned in the higher operations of the mind. This is the *portio dura* of the seventh pair, which proceeding from the union of the pons Varolii with the Medulla oblongata, and the Crura cerebelli, goes to all those muscles which are directly concerned in giving ex-

pressoir to the face, and is consequently the basis of physiognomical distinctions. All these nerves by supplying fluid, arrest absorption, and as thought like sensation is arrested by a reception of fluid sufficient to meet the demands of stimulus in the brain, it is evident that when by muscular contraction absorption is arrested, until lymph is accumulated in the system in quantity sufficient to supply the whole demand in the brain, then thought ceases, or in other words *sleep* supervenes.

§ VI OF DISEASES OF THE HUMAN BODY.

35. *Inflammation.* When a part is stimulated its *muscular* arteries contract, and consequently an increase of blood is thrown into the *cellular* arteries. When the increase of blood thus thrown in, is so great as to produce stimulation itself, then we have a case of *simple inflammation.* The lymph of the blood, yielding up its fluid to the negative receiver, is accumulated and coagulated in the part, which consequently becomes hard and swelled. The cellular lymphaticks of the part being tightly compressed refuse passage to the lymph. The *serum* somewhat modified accumulates, while the globules of muscular fibre and coagulated fibrin successively robbed of their fluid, become white globules. These together form *pus* and present us with a case of abcess.

Stimuli applied to any part of the body, by creating a demand for fluid & increasing the contractions of the muscular vessels, predisposes to inflammation in other parts.

36. *Fever.* When miasm is breathed the receivers of the lungs are stimulated, and carry off too great a portion of fluid from the muscular cells. This produces such effects as naturally arise from too large a proportion of fluid being furnished by the pulmonary receivers to the third order of ganglia on the one hand, and too sparing a distribution of fluid, by the pressure of expiration, on the other. When too large a portion of fluid is furnished by the pulmonary receivers, the quantity conveyed by the receivers of all the remainder of the *third order*, which are connected by equalizers, is proportionably diminished. This on the muscular fibre, by restraining contraction, will produce that effect called *debility*, most conspicuous in the heart. The power of the heart, which should equal the aggregate power of the muscular blood vessels, is then no longer able to force a passage into the external vessels which retain their full contractility. The blood is accordingly forced from them into the heart and great vessels, particularly those, which also, deriving their nerves from the third order, are weakened and forced to receive it. An increased supply of fluid from within now produces the sensation of *heat* or *thirst*, while a decreased supply from the external vascular fibres produces that of *cold*, from which condition, this has been called the *cold stage* of fever. The ex-

minished power with which the heart forces the blood to distant parts, produces the small weak pulse and on the skin paleness and contraction. In the brain it produces diminished sensation, weakness and confusion of thought, as well as of voluntary power. The *distension* of the heart and great vessels with blood, produces the fugitive pains headache and sense of weakness which prevail through the body with a fullness of the breast and precordia. The extreme vessels not being dilated cannot contract, and the heart and great vessels being unable to contract as usual, there is a diminished proportion of fluid furnished to the brain, so that this *stimulus of distension* renders the body negative, produces a spasm of the extreme muscular vessels of the surface, as well as of the liver, and other interiour organs, and increases lymphatick absorption. From the latter cause, *pus* is absorbed, and of course abscesses retreat. Bile is absorbed from the bowels and costiveness is produced. Mucilage is absorbed from the urine which now deposits no sediment. Mucus is absorbed from the bronchiæ, producing a sense of tightness with dry cough. The gustatory nerves attract particles of lymph, & robbing them of their fluid, consolidate them on the *papillæ*, producing the crusted tongue. As these supplies, from absorption, are exhausted, the muscles in turn yield a partial supply by small rapid alternate contractions, which constitute a *shake*; or, in some cases, by more violent & permanent contractions of particular muscles, constituting spasms or cramps. From a want of the usual press of fluid from the dischargers on the stomach during expiration the appetite ceases, and as the receivers of the stomach gain ascendency, this is followed by *aversion* to food, *nausea* and *vomiting*. The cells of the liver are not expanded for portal blood which is consequently arrested, and as by this route only, water reaches the *circulation*, the watery secretions, as urine, sweat, saliva, &c. are all diminished.

As the *stimulus of distension* increases, the contractions of the heart & great vessels become violent. Blood is driven into the extreme vessels, and the *hot stage* of fever is produced. The pulse is now fuller & stronger, heat and redness of the skin supervene, thirst, restlessness and headache, are increased, till the full quantity of fluid is furnished, and the stronger stimulus, by yielding an increased supply, begins to prevail. *Morbid absorption* now ceases, the crust disappears from the tongue, and the extreme vessels are relaxed.

Suppose the stimulus of distension, surpasses that of mirism, and transmits fluid enough to supercede that arising from its action, then the fluid carried off by the receivers of the lungs, will be again thrown into its proper channel. It will, as before, be driven in expiration by the dischargers, to the liver, the cells of which, give passage again, to the portal blood, so that the aqueous secretions again appear. The organick fibres of the stomach and fibrin of the blood being again supplied, the appetite and digestion recur. As the heart and vessels lose

themselves and distension ce[illegible]ases, the pains give way and fever closes for the present.

As soon as the disten- again becomes predom- it is weak it may nant and commences its operations as before. In [illegible], two or on- require three days to renew its effects. If more power[illegible] respec- ly one—being repeated at *quartan*, *tertian*, or *quotidian*, period tively, until the miasmatick stimulus subsides. If the miasmatick stimulus is too powerful, to yield altogether to the distensive stimulus, then the fever will only *remit*, and as the power of miasm increases the disease will approach the *continued* form. When the miasmatick begins to surpass the distensive stimulus, the re-action becomes more obscure or is altogether extinguished. Such is the case in *typhus gravior*, and more particularly in what is known, in the Southern States, by the name of *cold plague*.

§ VII. DISEASES OF THE MIND.

37. The action of the mind on the brain in producing thought, is modified by other stimuli, either on distant parts of the body, or on the brain itself. Any long continued stimulus, as that of distension, in dyspepsia, by contracting the muscular vessels of the brain, predisposes to undue fullness of its cellular vessels, on the application of mental stimulus. This exhibits, according to its degree, and the part stimulated, the various symptoms of *irritability*, *hypochondriac affections*, *melancholy*, and *madness*, and a still greater fullness of the vessels produces *delirium*. When the predisposition is caused by chemical stimulants conveyed through the circulation to the brain, the effects are *exhilaration*, *intoxication*, *&c. which cease with their causes.*

38. *Dyspepsia.* When the causes which diminish the contractors of the heart and great vessels, or increases that of the extreme vessels, is *slowly* applied and *long* continued, it produces a *habitual* distension of the former. The symptoms arising from this *chronic stimulus of distension*, constitute the disease known by the various names of *dyspepsia*, *liver complaint*, or *nervous complaint*. More or less of this stimulus of distension is found to prevail in most other chronick diseases of the system.

§ VIII. OF THE MODUS OPERANDI, OF MEDICINES.

39. Medicines taken into the stomach may be confined in their action, to the alimentary canal, or entering the circulation by veins or lymphaticks, according to laws already noticed, may act on other parts of the system. They may alter the circulating blood, as iron, which by increasing the red particles, is a *tonick*. They may

by easily receiving interstitial fluid, rob other particles of their proper quantities, and thus from their effects on the solids, they are denominated *astringents*. Or they may stimulate the nervous system, with various effect, according to their quality and the structure of parts in which the stimulated nervous fibril terminates. When this is in secreting or glandular structure, by contracting the calibre of the muscular arteries, they throw more blood into the cellular arteries, and thus the secretions being increased, and altered, the medicines are said to be *diuretick*, *diaphoretick*, *sialagogue*, &c. When on the brain they are *sedative*, *exhilarating*, *narcotick*, &c. When on the receivers of the lungs, as the blood passes through, the fluid which is otherwise disposed of by the pressure of expiration is carried off, as by the stimulus of miasm from the muscular cells. Absorption, by the dischargers of the heart, is at the same time diminished, and hence the aqueous secretions are increased, and the stomach and bowels being filled are stimulated to discharge their watery contents. These effects arise from tartarised antimony, neutral salts, &c. which are consequently classes of *emeticks* and *cathartick*s. The stimulus of distention will take place here as in the case of miasm, but in vomiting the pressure of the abdominal muscles assist the heart and great vessels to unload themselves, by which this stimulus is prevented, and the bile and other organized particles are permitted to flow and be discharged. In purging this does not take place, and of course the discharge of bile is arrested as before explained.

Medicines which stimulate the alimentary canal by increasing organick contractions and furnishing fluid to the fourth order, diminish its absorption, and consequently produce bilious discharges, such as *calomel*, *aloes*, *jalap*, and most of the vegetable bitters which are but very slowly if at all absorbable. These constitute a class of *cathartick*s known as *anti bilious*.

The less rapid but more durable stimulants of this class, such as *cinchona*, *columbo*, *gentian*, &c. are given to produce a more permanent effect on the canal. When the stimulus of distension exists, these medicines, by exciting increased contractions of the organic fibres, produce a supply of fluid to meet the demands of this stimulus of distention. This suspends pain, and the inordinate contractions of the extreme vessels being removed, they again receive blood from the heart, and the circulation being restored to the surface, the system recovers its vigor, from which these medicines constitute a class of *tonicks*.

ERRATA.

The author not having had leisure, to correct the proof, the reader will find, among many errors in orthography & punctuation, the article *Dyspepsia* placed under "diseases of the mind." It should have been numbered (37) and placed at the close of the preceding Section.